Human milk as infantile *Super Food*

Human milk is the essential and only natural source of all nutrients pivotal for the correct development of an infant. Current studies prove decreasing percentages of mothers who do not breastfeed or cannot breastfeed. In developed countries only around 25% of 1-year old children are being breastfed. It is caused by multiple factors of different etiology, including i.e. treatment of mental disorders, pharmacological treatments or lack of lactation. In case of impossibility of breastfeeding World Health Organization recommends use of donor human milk. For this purpose, there are currently over 800 of milk banks worldwide serving milk for children in need. Milk bank tasks include samples collection, storage as well as keeping quality control of donated human milk.

One of the key substances in inftants' diet are lipids, which compromise of around 4% of human milk content. Fats serve not only as a key source of energy for body cells but they also regulate multiple key physiological processes i.e. development and progress of inflammation. Former studies on the influence of the lipid composition of human milk and the development of an infant showed significant influence of varying lipids on the incidences of diabetes, obesity or cardiovascular diseases. Lipidome relates to the whole of fat molecules found in different biological matrices and it is composed of not only free fatty acids, but also include 7 other classes of polar and non-polar compounds of varying chemical structure and biological function.

Research goal

Goal of the present study is the development of quantitative untargeted analytical method of lipid profiling in human milk with use of modern technique of liquid chromatography coupled with high resolution mass spectrometry (LC-HRMS). During the project new lipid extraction protocol, chromatographic separation and optimized mass spectrometer method will be generated.

Analytical method resulting from this project will be used to examine lipidome of human milk samples collected by the Human Milk Bank Foundation (Medical University of Warsaw). Donated material will be divided to groups depending on the time of their collection at different lactation time points and based on the mothers' nutritional choices, which were analysed thanks to filled-in dietary questionnaires.

Expected influence of the project on scientific improvement

Results of this experimental study will serve for development of robust method for human milk lipidome analysis and will extend the knowledge on the influence of mother's diet and lactation period on the fat composition of their breast milk. Key effects of this project include:

1) Development of analytical method and report which will include all the results acquired during procedure optimization for both lipid extraction and LC-HRMS analysis of mass spectra. Analytical report could be used by other mass spectrometry laboratories to be implemented for their own studies;
2) Identification and quantitative analysis of human milk lipidome. Obtained information on the possible changes in the profile during different stages of lactation or due to dietary choices of the participants will allow for extending the knowledge on the influence of mothers' nutrition on the human milk composition and its potential effect on the infant development;
3) Substantial support of milk formula industry. Acquiring data on the lipidome composition of human milk as well as changes that it undergoes during 6-months lactation time, will allow for better and properly tailored formulas composition for the infants, and will result in positive effect on the child's development.